

ON THE EMERGENCE OF TWO TUBE-DWELLING HOMOPTEROUS INSECTS.

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(Plates XVII and XVIII).

PECTINARIOPHYES PECTINARIA Kirk.

A good account of the calcareous tubes made by this and an allied species, together with the curious nymphs that inhabit them, was given by F. Ratte,¹ in 1884; but the method of emergence was very briefly mentioned by this author. Kirkaldy² in 1906, placed these insects in the subfamily *Cercopinæ* and erected two new genera *Polychætophyes* and *Pectinariophyes* for their accommodation. Subsequently³ he placed them in the subfamily *Macherotinae*.

These calcareous tubes have been frequently observed by me, attached to small Eucalyptus saplings, and during the last two years I have included them amongst other studies in the life histories of Australian Homoptera. As far as I am aware the final ecdysis of these insects is not paralleled by that known of any other group. All the tubes seen, however, do not contain living nymphs, as those deserted in previous seasons, owing to their durable nature, remain on the twigs for an indefinite time. The empty tubes have a bleached appearance in comparison with those that are occupied. The occupied tubes contain a clear liquid, and in it the nymphs live submerged with their heads downwards. Their suctorial apparatus is inserted through a longitudinal slit on the inner side of the tube into the twig to which the tube is attached.

The first indication that the insect is about to emerge is the appearance of small bubbles at the mouth of the tube. This occurs in early spring, generally in the evening or at night. Viewed through a lens at this stage, the posterior end of the nymph is seen continually moving from side to side: this end protrudes for about a second, evidently to obtain a supply of air, and then retracts, after which fresh bubbles are blown; this renewing of the air supply takes place at intervals. The operation continues for about an hour, by which time a large mass of froth has been produced, covering the mouth of the tube and hanging over the side. When about to emerge, the nymph forces its way to the top of the tube, protruding its posterior end first until the legs have reached the lip. It then swings itself over, and with the head now upward it climbs down the outer side of the tube until it is merged

¹ Proc. Linn. Soc. N.S.W., Vol. IX, p. 1164, 1884.

² Bull. Haw. Sugar Plant. Exp. Sta. i, pp. 384-386, 1906.

³ Bull. Haw. Sugar Plant. Exp. Sta. xii, p. 10, 1913.

into the froth which has accumulated on the lower side. There is constant movement inside the mass of froth caused by the insect getting out of its nymphal skin. The froth now gradually subsides; all movement has ceased, and the newly-emerged insect is seen clinging to the empty nymph skin, which in turn is clinging to the side of the tube.

The pale-yellow wingless insect remains quite motionless. After a short interval tiny tegmina and wingbuds begin to appear. These expand rapidly, and in half an hour from the time they were first seen are fully developed. While this growth develops, and for some time after, the wings hang down perpendicularly; they are then suddenly flexed once or twice, and closed to their normal roof-like position. At this stage, though rather soft, the insect is able to walk and jump, but if left undisturbed it will remain quietly on the twig until the next day.

The time occupied by the metamorphosis of this insect is about an hour, and the total period from the first appearance of the froth, about two hours. The capture of adult specimens by me, in September and January, proves that there are two broods a year.

POLYCHÆTOPHYES SERPULIDIA Kirk.

This insect occurs in the Brisbane district, but more sparingly than the previous species. The tubes differ from that species in their larger size, darker colour, and the transverse serrated lines, which give them a coarser texture. They are invariably attached to the twigs for their entire length, while in the previously mentioned species, the upper part of the tube is always bent out away from the twig. This causes a slight difference in the method of exit between the two species. When the froth is coming from the tube it often runs down the twig instead of the tube, dependent on the angle at which the twig is inclined. The emerging nymph following the froth consequently often clings to the twig instead of the tube to undergo its metamorphosis. When this occurs, the insect immediately after emergence generally walks a little way up the twig and there stops while its wings develop. In other respects its method of emergence is similar to that of *Pectinariophyes pectinaria*, and the time occupied is about the same.

F. Ratte remarks:—"In the dry parts of the interior it is probable that the water contained in these shells is resorted to for drinking by the ants so numerous in Australia, as if it was a speciality among the small homopterous insects to provide during their life for the Formicidæ." All the evidence which I have acquired in the coastal district is against the above opinion; no ants have been seen drinking the liquid, nor were any noticed in the vicinity of the tubes. It is well known that many Coccidæ, Membracidæ, &c., excrete liquids which are eagerly sought by ants. In return the Homoptera receive certain services from the ants, so the benefit is reciprocal; but in the case of these soft tube-dwelling nymphs it would be of no service to be robbed of their protective liquid, without which they would speedily perish.

REMARKS ON THE ILLUSTRATIONS.

(Plates XVII and XVIII.)

Pectinariophyes pectinaria Kirk.—Figs. 1, 2, 3, and the upper insect in fig. 4.
Polychatophyes serpulidia Kirk.—Figs. 5, 6, 7, 8, and the lower insect in fig. 4.
Figs. 1 and 5 show the first appearance of the nymphs of both species, while forcing their way, posterior ends first, out of their tubes. The next stage is shown at fig. 6, where the nymph is clinging to the twig, while its skin is about to split longitudinally up the back. In figs. 2 and 7, the upper portion of the insects are free, while they are supported by their lower parts which are still enclosed in the nymphal skins; the wings are seen beginning to develop. Figs. 3 and 8 show the fully developed insects resting in their characteristic positions. In fig. 8, a circular anal plate can be seen on the empty nymph skin; it is peculiar to this species, and is used by the nymph as an operculum to close the mouth of its tube.
